AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Listing of Claims:

1   1.   (Currently Amended) A method of processing traffic received from
2 an InfiniBand node via a first queue pair, comprising:
3   selecting a traffic entry in an InfiniBand receive queue, wherein said traffic
4 entry comprises one of:
5   a Send command comprising an encapsulated communication;
6   a Send command comprising an RDMA Read descriptor; and
7   an RDMA Read response comprising a response to an RDMA
8   Read request;
9   if said selected traffic entry comprises a Send command comprising an
10 RDMA Read descriptor:
11   issuing a first RDMA Read request to retrieve one or more portions
12   of a communication described by said RDMA Read descriptor;
13   in a linked list corresponding to the first queue pair, adding an
14   entry corresponding to said first RDMA Read request, said entry
15   <u>comprising a first sequence number and a last sequence number that</u>
16   <u>identify a range of sequence numbers associated with expected responses</u>
17   <u>to said first RDMA Read request and optionally comprising a sequence</u>
18   <u>number of the most recently received response or a link to the next entry of</u>
19   <u>in the linked list</u><s>identifying a range of sequence numbers associated with</s>
20   <s>expected responses to said first RDMA Read request</s>; and
21   in a retry queue, adding an entry corresponding to said first RDMA

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22   Read request; and

23   if said selected traffic entry comprises an RDMA Read response to said

24   first RDMA Read request:

25   identifying a sequence number associated with said RDMA Read

26   response;

27   comparing said sequence number to said range of sequence

28   numbers;

29   storing said one or more portions of said described communication

30   to facilitate assembly of said described communication in said queue; and

31   if said sequence number matches a final sequence number in said

32   range, retiring in said retry queue said entry corresponding to said first

33   RDMA Read request.

1   2.   (Original) The method of claim 1, further comprising:

2   forwarding a communication associated with said selected traffic entry, for

3   transmission on an external communication link, wherein said communication is

4   one of:

5   said encapsulated communication; and

6   said described communication, after said described communication

7   is assembled.

1   3.   (Original) The method of claim 1, further comprising, if said

2   selected traffic entry comprises an RDMA Read response to said first RDMA

3   Read request:

4   if said sequence number does not match said final sequence number,

5   updating said entry in said linked list to include said sequence number.

1   4.   (Original) The method of claim 1, further comprising:

3

2   maintaining a single memory structure comprising multiple linked list,

3 including said linked list;

4   wherein each linked list stores entries associated with RDMA Read

5 requests for a different InfiniBand queue pair.

1   5. (Original) The method of claim 1, further comprising:

2   maintaining a single memory structure for queuing InfiniBand traffic

3 received via multiple virtual lanes and multiple queue pairs, said single memory

4 structure comprising said queue.

1   6. (Original) The method of claim 5, wherein said queue comprises a

2 linked list of memory buffers within said single memory structure.

1   7. (Original) The method of claim 1, further comprising:

2   maintaining a head pointer configured to identify a head of said linked list;

3 and

4   maintaining a tail pointer configured to identify a tail of said linked list.

1   8. (Currently Amended) The method of claim 1, further comprising:

2   maintaining a head pointer configured to identify a head of said queue;

3   maintaining a tail pointer configured to identify a tail of said queue; and

4   maintaining a next traffic entry pointer configured to identify a next entry

5 in said queue to be processed ~~after said forwarding~~.

1   9. (Original) The method of claim 8, wherein said tail pointer is

2 configured to identify where in said queue a next traffic entry is to be queued.

1   10. (Original) The method of claim 1, further comprising, if said

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2 selected traffic entry comprises an RDMA Read descriptor:

3   appending space to a head of said queue;

4   wherein said described communication is assembled in said appended

5 space.

1   11. (Original) The method of claim 1, further comprising, if said

2 selected traffic entry comprises an RDMA Read response to said first RDMA

3 Read request:

4   dropping an RDMA Read response received out of order; and

5   requesting a retry of said first RDMA Read request.

1   12. (Currently Amended) A computer readable medium storing

2 instructions that, when executed by a computer, cause the computer to perform a

3 method of processing traffic received from an InfiniBand node via a first queue

4 pair, the method comprising:

5   selecting a traffic entry in an InfiniBand receive queue, wherein said traffic

6 entry comprises one of:

7   a Send command comprising an encapsulated communication;

8   a Send command comprising an RDMA Read descriptor; and

9   an RDMA Read response comprising a response to an RDMA

10 Read request;

11   if said selected traffic entry comprises a Send command comprising an

12 RDMA Read descriptor:

13   issuing a first RDMA Read request to retrieve one or more portions

14 of a communication described by said RDMA Read descriptor;

15   in a linked list corresponding to the first queue pair, adding an

16 entry corresponding to said first RDMA Read request, said entry

17 comprising a first and a last sequence numbers that identify a range of

18   sequence numbers associated with expected responses to said first RDMA

19   Read request and optionally comprising a sequence number of the most

20   recently received response or a link to the next entry of in the linked list

21   ~~identifying a range of sequence numbers associated with expected~~

22   ~~responses to said first RDMA Read request~~; and

23   in a retry queue, adding an entry corresponding to said first RDMA

24   Read request; and

25   if said selected traffic entry comprises an RDMA Read response to said

26 first RDMA Read request:

27   identifying a sequence number associated with said RDMA Read

28   response;

29   comparing said sequence number to said range of sequence

30   numbers;

31   storing said one or more portions of said described communication

32   to facilitate assembly of said described communication in said queue; and

33   if said sequence number matches a final sequence number in said

34   range, retiring in said retry queue said entry corresponding to said first

35   RDMA Read request.

1   13.   (Currently Amended) A method of tracking responses to an RDMA

2   Read operation, the method comprising:

3   issuing an RDMA Read on a first communication connection;

4   identifying a range of sequence numbers to be associated with responses to

5   the RDMA Read;

6   adding an entry to a first linked list corresponding to the first

7   communication connection, said entry comprising ~~configured to identify~~:

8   a first and a last sequence numbers that identify said range of

9   sequence numbers; ~~and~~

6

10	a latest sequence number received in said range of sequence
11	numbers;
12	optionally a link to the next entry of in the linked list;
13	receiving a first RDMA Read response;
14	determining whether a first sequence number associated with the first
15	RDMA Read response matches a last sequence number in said range of sequence
16	numbers; and
17	if said first sequence number does not match said last sequence number,
18	updating said latest sequence number to match said first sequence number.

1	14. (Original) The method of claim 13, further comprising:
2	if said first sequence number matches said last sequence number, retiring
3	an entry in a retry queue corresponding to the RDMA Read.

1	15. (Original) The method of claim 13, wherein the first
2	communication connection is an InfiniBand queue pair.

1	16. (Original) The method of claim 15, wherein:
2	said issuing is performed by an InfiniBand transmit module; and
3	said adding, said determining and said updating are performed by an
4	InfiniBand receive module;
5	the method further comprising:
6	at the InfiniBand transmit module, retrying the RDMA Read if an RDMA
7	Read response associated with said range of sequence numbers is received out of
8	order.

1	17. (Original) The method of claim 15, wherein:
2	said issuing is performed by an InfiniBand transmit module; and

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3   said adding, said determining and said updating are performed by an

4 InfiniBand receive module;

5   the method further comprising, at the InfiniBand transmit module:

6   maintaining a retry queue for tracking RDMA Reads that have not

7   yet completed; and

8   retiring an entry in said retry queue corresponding to the RDMA

9   Read if RDMA Read responses corresponding to said range of sequence

10   numbers are received in order.

1   18.   (Original) The method of claim 17, further comprising, at the

2 InfiniBand transmit module:

3   retrying the RDMA Read if RDMA Read responses corresponding to one

4 or more of said range of sequence numbers are received out of order.

1   19.   (Original) The method of claim 13, wherein said identifying

2 comprises:

3   dividing an amount of data to be received in response to the RDMA Read

4 by a maximum transfer unit in effect for the first communication connection.

1   20.   (Original) The method of claim 13, further comprising:

2   maintaining a single memory structure comprising multiple linked lists

3 corresponding to multiple communication connections, including said first linked

4 list corresponding to the first communication connection.

1   21.   (Original) The method of claim 20, further comprising:

2   for each of the multiple communication connections, including the first

3 communication connection, maintaining pointers to the first entry and the last

4 entry in the corresponding linked list.

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1   22.   (Original) An apparatus for queuing multiple types of receive

2   traffic in a communication interface, comprising:

3   a queue for queuing multiple types of receive traffic associated with

4   communications to be transmitted from the communication interface;

5   a head pointer configured to identify a head of said queue;

6   a tail pointer configured to identify a tail of said queue, wherein said

7   traffic commands are enqueued at said tail;

8   a next entry pointer configured to identify a next entry in said queue to be

9   processed; and

10   a linked list, wherein each entry in said linked list corresponds to an

11   RDMA Read request issued by the communication interface, and is configured to

12   identify a range of sequence numbers associated with expected responses to the

13   RDMA Read request.

1   23.   (Original) The apparatus of claim 22, wherein each entry said

2   linked list is further configured to identify a sequence number of a most recently

3   received response to the RDMA Read request.

1   24.   (Original) The apparatus of claim 22, wherein the linked list is one

2   of multiple linked lists, each said linked list corresponding to a separate

3   InfiniBand queue pair.

1   25.   (Original) The apparatus of claim 22, further comprising:

2   a retry queue, wherein a retry entry is added to said retry queue for each

3   RDMA Read request issued by the communication interface;

4   wherein a first retry entry in said retry queue corresponding to a first

5   RDMA Read request is retired when said expected responses to the first RDMA

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6   Read request are received.

1   26.   (Original) The apparatus of claim 22, further comprising:

2   a memory configured to store pointers to a first entry and a last entry in

3   said linked list.

1   27.   (Original) The apparatus of claim 22, wherein said queue

2   comprises an assembly area for assembling a communication associated with a

3   first type of receive traffic.

1   28.   (Original) The apparatus of claim 27, wherein said assembly area

2   comprises a portion of said queue delimited by said head pointer and said next

3   entry pointer.

1   29.   (Original) The apparatus of claim 27, wherein said first type of

2   receive traffic is an InfiniBand RDMA Read command comprising a set of

3   RDMA read descriptors configured to identify the communication associated with

4   said first type of receive traffic.

1   30.   (Original) The apparatus of claim 29, wherein a second type of

2   receive traffic is an InfiniBand Send command configured to encapsulate the

3   communication associated with said second type of receive traffic command.

1   31.   (Original) The apparatus of claim 27, wherein:

2   said first type of receive traffic comprises a set of descriptors, wherein

3   each said descriptor is configured to describe a portion of the communication

4   associated with said first type of receive traffic; and

5   the apparatus is configured to issue read requests to retrieve the portions of

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6   the communication described by the set of descriptors and assemble said portions

7   in said assembly area.

1   32.   (Original) The apparatus of claim 22, further comprising:

2   a transmit module configured to transmit the communications associated

3   with said receive traffic;

4   wherein each communication associated with receive traffic is forwarded

5   from said queue to said transmit module after the communication is determined to

6   be complete.

1   33.   (Original) The apparatus of claim 32, wherein a communication is

2   forwarded from said queue to said transmit module by passing to the transmit

3   module a set of pointers delimiting the communication within said queue.

1   34.   (Original) The apparatus of claim 22, wherein said queue

2   comprises a linked list of buffers within a memory structure configured to queue

3   receive traffic for multiple communication connections.

1   35.   (Currently Amended) A communication interface for tracking

2   responses to an InfiniBand RDMA Read request, comprising:

3   for each of one or more active InfiniBand queue pairs, a corresponding

4   linked list, wherein each entry in said linked list is configured to include:

5   a first and a last sequence numbers that identify a range of

6   sequence numbers associated with expected responses to an RDMA Read

7   request issued on the corresponding queue pair by the communication

8   interface; and

9   a previous sequence number, wherein said previous sequence

10   number is a sequence number associated with a most recently received

11

11   response to the RDMA Read request; and

12   optionally a link to the next entry of in said linked list; and

13   for each of the linked lists, pointers to a first entry and a last entry in said

14 linked list.

1   36.   (Original) The communication interface of claim 35, further

2 comprising:

3   a retry queue configured to queue retry entries corresponding to RDMA

4 Read requests issued by the communication interface;

5   wherein an retry entry in said retry queue is retired when a final response

6 to a corresponding RDMA Read request is received, said final response being

7 identified by a final sequence number in said range of sequence numbers.

1   37.   (Original) The communication interface of claim 35, further

2 comprising:

3   a transmit module configured to:

4   issue a first RDMA Read request on a first queue pair; and

5   calculate said range of sequence numbers associated with said

6   expected responses to the first RDMA Read request; and

7   a receive module configured to add an entry, corresponding to the first

8 RDMA Read request, to said corresponding first linked list.

1   38.   (Original) The communication interface of claim 37, wherein said

2 receive module is further configured to:

3   determine a sequence number of a response to the first RDMA Read

4 request; and

5   determine if said sequence number matches a final sequence number in

6 said range of sequence numbers associated with expected responses to the first

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7   RDMA Read request.

1   39.   (Original) The communication interface of claim 38, wherein said

2   receive module is further configured to:

3   determine if said sequence number is out of order.